# APPENDIX G

## WETLANDS

### Introduction

This appendix outlines the analysis methodology used to evaluate impacts on wetland habitats in this Environmental Impact Statement (EIS). The analysis procedures were applied to representative sections of land located throughout the State. Wetland GIS mapping, based on a simplified classification system developed by the State Department of Natural Resources (DNR), was available for these representative sections. This classification system consolidates like wetland habitats into three major categories, and then classifies wetlands within these categories according to wetland types defined in the Washington State Forest Practices Rules. This wetland classification system facilitates the application and quantitative analysis of the principal wetland protection measures outlined under the three alternatives (Table 1). However, it is important to note that the alternatives contain protection measures or processes (GIS mapping, development of new wetland classification, road mitigation, etc.) which cannot be modeled. Therefore, a qualitative analysis for these provisions is conducted in the EIS.

A method of reducing impacts on wetlands from land management activities is to apply a protective buffer around wetland sites. Under the alternatives, protective buffers or wetland management zones (WMZs) are applied to non-forested wetland sites. Forested wetlands can be harvested, but are afforded some level of protection, such as reduced harvest or exclusion of harvest equipment (Table 1).

Characteristics of buffer zones, particularly slope and vegetative cover, directly influence the buffer zones effectiveness. Up to a point, the effectiveness of removing sediments, nutrients, bacteria, and other pollutants from surface water runoff increases with buffer width. Although buffer protection distances for wetlands can vary markedly, depending upon site conditions, buffers of 100 feet or greater have been found to control course and fine sediments if channelization in the buffer zone does not occur (Broderson, 1973; Corbett and Lynch, 1985; Lynch et al., 1985). Additionally, buffers of at least 100 feet have been found to minimize water temperature fluctuations (Lynch et al., 1985).

## Analysis Approach

The evaluation criteria utilized for the analysis includes the effectiveness of land management programs in providing protection to wetlands and their associated functions (Table 1). The functions of wetlands that are the focus of evaluation include fish and wildlife habitat, water

**Table 1.** Wetland Protection Measures Under the Alternatives

| | Alt. 1 | Alt. 2 | Alt. 3 |
|---|---|---|---|
| **Wetland Types** | Non-forested wetlands with open water (Type A)<br>Non-forested wetlands (Type B)<br>Forested Wetlands | Non-forested wetlands with open water (Type A)<br>Non-forested wetlands (Type B)<br>Forested Wetlands | Non-forested wetlands with open water (Type A)<br>Non-forested wetlands (Type B)<br>Forested Wetlands |
| **WMZs, Wetland Mapping and Classification.** | - Wetland buffers are variable depending on the size and type of wetland (see Table 3). Within WMZ, leave a total of 75 trees per acre greater than 6 inches dbh in Western Washington and greater than 4 inches in Eastern Washington. Twenty-five shall be greater than 12 inches dbh including 5 trees greater than 20 dbh.<br>- Individual trees or forested wetland areas less than 0.5 acre in size may occur. These trees have a high habitat value to the nonforested wetland. Leave individual trees or forested wetland less than 0.5 acre.<br>- No timber shall be felled into or cable yarded across open water or emergent wetlands. Harvest shall not be allowed within a open water wetland which meets the definition of a bog.<br>- Partial-cutting or removal of groups of tree is acceptable within the WMZ but the maximum width of opening created by harvesting shall not exceed 100ft as measured parallel to the wetland edge.<br>- Harvest of upland areas or forested wetlands which are surrounded by open water and emergent wetlands must be conducted in accordance with a plan, approved in writing of the department.<br>- Openings shall not be closer than 200 feet without approval. Ground based equipment is not allowed within a WMZ without written approval. When 10% or more of a harvest unit lies within a WMZ and either the harvest unit is a clearcut of 30 acres or less or the harvest unit is a partial cut of 80 acres or less, leave not less than 50% of trees as described above. | Same as Alternative 1 except:<br>- Protection of forested seeps and springs with an obvious connection to Type N perennial streams.<br>- Changes in wetland mapping techniques and GIS wetland coverage updates | Same as Alternative 1 except:<br>- Increased buffer widths on Type A and B wetlands (see Table 3)<br>- Forested wetlands, then leave snags, non-merchantable trees, understory vegetation and 70% canopy closure.<br>- Includes the adoption of a new wetland classification system (likely hydrogeomorphic) that would identify functions of wetland types within the landscape, thereby, providing a mechanism for implementing applicable protection measures for different wetland types and enhancing the level of wetland protection.<br>- Increased wetland mitigation ratio, generally a 2:1 acre basis. |
| **Roads and Landings** | - In planning roads wetlands will try to be avoided. If wetlands can't be avoided, reduce impact by minimizing subgrade width and spoil areas.<br>- An accurate delineation of wetland boundaries shall be required for road or landing construction which fills or drains more than 0.5 acre of a wetland. If unable to minimize impacts to wetlands, restore affect areas, reduce impacts, or replace affected wetland on an acre for acre basis and of the same type and in the same general location.<br>- Minimize placement and size of landing within wetlands. Landings shall not be located in Type A or B wetlands or their Wetland Management Zones. Spoil shall be located outside of Type A and Type B wetlands and their wetland management zones. No spoil area greater than 0.5 acre is size shall be allowed within wetlands and spoil shall not be located within the boundaries of forested wetlands without written approval of the Department and unless a less environmentally damaging location is unavailable. | Same as Alternative 1 except:<br>- Avoid net loss of wetland function during road and landing construction by either selecting the least environmentally damaging location, minimize impacts by reducing the sub-grade width, fill acreage and spill areas, or restore affected areas by removing temporary fills or road sections upon completion, or reduce or eliminate impacts over time by preserving or maintaining areas, or replace affected areas by creating new wetlands or enhancing existing wetlands.<br>- An accurate wetland delineation will be completed if road or landing construction fills or drains more than (0.1) one tenth of a wetland. Filling or draining more than 0.5 acre of a wetland requires replacement by substitution or enhancement of the lost wetland functions, generally with a two-for-one basis of the same type and in the same general location.<br>- Roads shall not be constructed in bogs or low nutrient fens and roads shall not be located in wetlands if there would be substantial loss or damage to wetland functions or acreage unless the department has determined that alternatives will cause greater damage to public resources. | Same as Alternative 2 |

quality and hydrology with an emphasis on water quality and fish habitat. The quantitative evaluation of wetlands under the alternatives includes: 1) an analysis of the acres of non-forested wetlands and their associated buffers protected under the establishment of WMZs, and 2) an analysis of acres of forested wetlands and non-forested wetlands (including WMZs) provided incidental protection by the establishment of Riparian Management Zones (RMZs).

To provide a perspective from which to evaluate the effects on wetlands under the alternatives, the types and amounts (acres) of wetlands within the representative sample sections were identified using the GIS DNR wetland habitat type coverage. Wetland types are evaluated using the Washington State Forest Practice Rules, which separate out wetland habitats into three major categories: forested, non-forested, and open water. The non-forested wetlands are further divided into Type A wetlands (greater than 0.5 acre, with open water) and Type B (other non-forested wetlands), and other (forested wetlands and open water habitats). A quantitative comparison has been made between the alternatives evaluating their varying protection levels and the amount of wetlands that occur within them. It is important to note that wetlands that occur within RMZs under the alternatives will provide additional protection depending upon land management practices associated with the RMZs (see riparian analysis). Therefore, the quantitative analysis also includes the amount and type of wetlands (including WMZs) that occur within these RMZs. This analysis will not identify different prescriptions with the established RMZs, but will yield a total acreage of wetlands occurring within the management buffers. A qualitative discussion has been incorporated in the analysis for the EIS that evaluates the impacts of roads and road use on wetland sites under the alternatives. Additionally, changes in wetland mapping, GIS wetland coverage updates, and the development of new wetland classification systems, that address wetlands functions as they relate to wetland protection, are also addressed.

## GIS Wetland Coverage Description

A GIS program was used to quantify the type and acreage of wetland projected under the alternatives using the updated DNR Wetland Coverage . The DNR wetland coverage utilized the National Wetland Inventory (NWI) data and combined the various wetland classifications into three categories: forested, non-forested, open water (Table 2). It then further classified these wetland types into Type A, B, and other wetlands sites (wetlands that don't fit into either category). The majority of wetlands identified on the NWI maps were mapped from stereo-paired aerial photos, collected at a scale of 1:58,000, with limited field verification. Inherent difficulties in identifying wetlands on aerial photography can lead to under representation of wetland sites at the landscape scale (USFWS, 1994). In particular, forested wetland sites are generally under represented due to difficulties in identifying and mapping wetlands from photos through tree canopies. Therefore, to more accurately identify forested wetland habitats within the sections, the DNR hydric soil layer was overlaid on the DNR forest type layer. This newly developed layer was then combined with the existing DNR wetland coverage to update acreages of forested wetland habitats. Hydric soils also may include non-wetland habitats. Therefore, the acreage of forested wetlands identified through the application of this data layer may have overestimated the amount of forested wetlands.

**Table 2.** DNR Classification of NWI Designations

| Forested Wetland | Open Water Wetland | | Vegetated Wetland |
|---|---|---|---|
| Palustrine Forested | Palustrine open water | Lacustrine limnetic unconsolidated bottom | Palustrine unconsolidated bottom palustrine moss lichen |
| | | Lacustrine limnetic aquatic bed | Palustrine emergent |
| Estuarine Forested | Palustrine river bed | Lacustrine limnetic open water | Lacustrine littoral unconsolidated shore |
| Forested habitats occurring on hydric soils [1/] | Palustrine Unconsolidated Water | Lacustrine littoral rock bottom | Lacustrine littoral emergent |
| | Palustrine Aquatic Bed | Lacustrine littoral unconsolidated bottom | Palustrine scrub-shrub |
| | Palustrine unconsolidated shore | Lacustrine littoral aquatic bed | |
| | Lacustrine limnetic rock bottom | Lacustrine littoral rock shore | |
| | | Lacustrine littoral unconsolidated shore | |
| | | Lacustrine littoral open water | |

[1/=] Forested wetland habitats identified through hydric soil and vegetation data sets.

## Analysis Rules

### Alternative 1

- If a non-forested wetland with open water (Type A) (including bogs) and > 5 acres, then average WMZ= 100’
- If a non-forested wetland with open water (Type A) (including bogs) and 0.5 to 5 acres, then average WMZ= 50’
- If a non-forested wetland with open water (Type A) and 0.25 to 0.5 acres (bogs only) then minimum WMZ= 50’
- If a non-forested wetland (Type B) and > 5 acre, then average WMZ = 50’
- If a non-forested wetland (Type B) and 0.5 to 5 acre, then average WMZ = 25’
- If a non-forested wetlands (Type B) 0.25 to 0.5, then WMZ = 0

### Alternative 2

- If a non-forested wetland with open water (Type A) (including bogs) and > 5 acres, then average WMZ= 100’
- If a non-forested wetland with open water (Type A) (including bogs) and 0.5 to 5 acres, then average WMZ= 50’
- If a non-forested wetland with open water (Type A) and 0.25 to 0.5 acres (bogs only) then minimum WMZ= 50’

- If a non-forested wetland (Type B) and > 5 acre, then average WMZ = 50'
- If a non-forested wetland (Type B) and 0.5 to 5 acre, then average WMZ = 25'
- If a non-forested wetlands (Type B) 0.25 to 0.5, then WMZ = 0

**Alternative 3**

- If a non-forested wetland with open water (Type A) and > 5 acres, then WMZ = 200'
- If a non-forested wetland with open water (Type A) and 0.25-5 acres, then WMZ = 200'
- If a non-forested wetland (Type B) and > 5 acres, then WMZ = 100'
- If a non-forested wetland and (Type B) 0.25-5 acres, then WMZ = 100'
- If a forested wetland, then leave snags, non-merchantable trees, understory vegetation and 70 percent canopy closure.

## Results

Table 3 displays the acreage of wetlands on forested lands in the sample sections protected by WMZs under the alternatives by owner and region. Table 4 displays the acreage of non-protected wetlands in the sample sections that would be incidentally protected through the establishment of WMZs and RMZs.

**Table 3**. Acreage of Wetlands in the Sample Sections that Would Be Protected by WMZs By Alternative

| | Forested Wetland | | Open Water | | Type A | | Type B | |
|---|---|---|---|---|---|---|---|---|
| Alternatives | Not Protected by WMZs | Protected By WMZs | Not Protected by WMZs | Protected by WMZs | Not Protected by WMZs | Protected by WMZs | Not Protected by WMZs | Protected by WMZs |
| **Alternative 1** | | | | | | | | |
| Private, West Side | 2,395.9 | 0.0 | 10.9 | 0.0 | 2.4 | 308.4 | 6.6 | 0.0 |
| Private, East Side | 351.4 | 0.0 | 5.9 | 0.0 | 0.2 | 106.8 | 2.2 | 0.0 |
| State, East Side | 46.6 | 0.0 | 0.6 | 0.0 | 0.0 | 18.2 | 0.6 | 0.0 |
| **Total** | **2,793.8** | **0.0** | **17.5** | **0.0** | **2.6** | **433.5** | **9.4** | **0.0** |
| **Alternative 2** | | | | | | | | |
| Private, West Side | 2,395.9 | 0.0 | 10.9 | 0.0 | 2.4 | 308.4 | 6.6 | 0.0 |
| Private, East Side | 351.4 | 0.0 | 5.9 | 0.0 | 0.2 | 106.8 | 2.2 | 0.0 |
| State, East Side | 46.6 | 0.0 | 0.6 | 0.0 | 0.0 | 18.2 | 0.6 | 0.0 |
| **Total** | **2,793.8** | **0.0** | **17.5** | **0.0** | **2.6** | **433.5** | **9.4** | **0.0** |
| **Alternative 3** | | | | | | | | |
| Private, West Side | 2,395.9 | 0.0 | 10.9 | 0.0 | 2.4 | 308.4 | 0.0 | 6.6 |
| Private, East Side | 351.4 | 0.0 | 5.9 | 0.0 | 0.2 | 106.8 | 0.0 | 2.2 |
| State, East Side | 46.6 | 0.0 | 0.6 | 0.0 | 0.0 | 18.2 | 0.0 | 0.6 |
| **Total** | **2,793.9** | **0.0** | **17.5** | **0.0** | **2.6** | **433.5** | **0.0** | **9.4** |

**Table 4**. Acreage of Non-protected Wetlands in the Sample Sections that Would Be Incidentally Protected Through the Establishment of WMZs and RMZs by Alternative

| Alternative and Wetland Type | Acre of Wetlands Protected by WMZs Only | | | Acre of Wetlands Protected by RMZs[1/] Only | | | Acre of Wetlands Protected by Both WMZs and RMZs[1/] | | |
|---|---|---|---|---|---|---|---|---|---|
| | East Side | West Side | State Wide | East Side | West Side | State Wide | East Side | West Side | State Wide |
| **Alternative 1** | | | | | | | | | |
| Forested | 59.5 | 117.0 | 176.5 | 22.0 | 348.7 | 370.7 | 3.5 | 18.7 | 22.2 |
| Non-forested | 0.2 | 1.3 | 1.5 | 0.0 | 0.9 | 0.9 | 0.0 | 0.8 | 0.8 |
| Open water | 0.0 | 0.7 | 0.7 | 0.3 | 4.0 | 4.3 | 0.0 | 1.8 | 1.8 |
| **Total** | **59.7** | **118.9** | **178.6** | **22.3** | **353.6** | **375.9** | **3.5** | **21.3** | **24.7** |
| **Alternative 2** | | | | | | | | | |
| Forested | 48.1 | 106.6 | 154.7 | 49.7 | 497.4 | 547.0 | 17.0 | 29.3 | 46.3 |
| Non-forested | 0.2 | 1.0 | 1.2 | 0.1 | 1.3 | 1.4 | 0.0 | 1.1 | 1.1 |
| Open water | 0.0 | 0.4 | 0.4 | 2.4 | 6.0 | 8.4 | 0.0 | 2.0 | 2 |
| **Total** | **48.4** | **108.0** | **156.4** | **52.2** | **504.7** | **556.9** | **17.0** | **32.4** | **49.4** |
| **Alternative 3** | | | | | | | | | |
| Forested | 53.1 | 211.2 | 264.3 | 106.9 | 833.0 | 939.9 | 80.8 | 157.7 | 238.5 |
| Non-forested | 0.2 | 0.0 | 0.2 | 0.1 | 0.5 | 0.6 | 0.0 | 1.6 | 1.6 |
| Open water | 0.0 | 0.0 | 0.0 | 5.7 | 4.3 | 10.0 | 0.0 | 5.2 | 5.2 |
| **Total** | **53.3** | **211.2** | **264.5** | **112.7** | **837.8** | **950.5** | **80.8** | **164.5** | **245.3** |

1/ For this purpose, the entire RMZ width was included for the analysis (e.g., in Alternative 2, core inner and outer zones were included).

## References

Broderson, J.M. 1973. Sizing Buffer Strips to Maintain Water Quality. M.S. Thesis, University of Washington, Seattle, Washington.

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